
New Combinations in *Silphium* (Asteraceae: Heliantheae)

Jennifer A. Clevinger

Department of Biology, James Madison University, Harrisonburg, Virginia 22807, U.S.A.
clevinja@jmu.edu

ABSTRACT. As part of a revision of *Silphium* (Asteraceae: Heliantheae) for the *Flora of North America* (FNA), four new combinations are proposed: *S. asteriscus* var. *simpsonii* (Greene) J. A. Clevinger, *S. asteriscus* var. *trifoliatum* (L.) J. A. Clevinger, *S. asteriscus* var. *latifolium* (A. Gray) J. A. Clevinger, and *S. radula* var. *gracile* (A. Gray) J. A. Clevinger. In addition, *Silphium confertifolium* Small is reduced to synonymy of *Silphium asteriscus* var. *latifolium*, and *Silphium simpsonii* var. *wrightii* L. M. Perry is reduced to synonymy of *Silphium radula* Nuttall. *Silphium radula* var. *gracile* is lectotypified.

Key words: Asteraceae, Compositae, Heliantheae, North America, *Silphium*.

As part of a revision of *Silphium* L. (Asteraceae: Heliantheae) in Clevinger's (1999) dissertation, 7000 herbarium specimens from 16 herbaria were examined and populations in 22 states were visited. A molecular phylogenetic study of *Silphium* explored relationships in *Silphium* resulting in the recognition of two monophyletic sections: sect. *Silphium* and sect. *Composita* (Clevinger & Panero, 2000). As a result of these studies and subsequent collecting, four nomenclatural changes in *Silphium* sect. *Silphium* are proposed. Three species names are reduced to varietal rank, and one varietal name is transferred to a different species. These nomenclatural changes pave the way for the taxonomic treatment of *Silphium* that is currently being prepared for the *Flora of North America*.

SILPHIUM ASTERISCUS L.

The most current circumscription of *Silphium asteriscus* can be found in Cronquist (1980). His concept of *Silphium asteriscus* includes three varieties: var. *asteriscus*, var. *angustatum* A. Gray, and var. *scabrum* Nuttall. This taxonomic concept should be expanded to include *S. dentatum* Elliott, *S. trifoliatum* L., and *S. confertifolium* Small, all of which Cronquist recognized as species. It should also include *S. simpsonii* Greene, which Cronquist placed in synonymy of *S. gracile* A. Gray. These taxa all share the characteristics of having a variable num-

ber of ray flowers ranging from 8 to 21 and lanceolate to ovate leaves. Cronquist used phyllotaxy and presence or absence of pubescence on stems, leaves, and paleae to distinguish between these species. However, my field observations reveal variability in these characters within populations found where the geographical ranges of these taxa overlap. This variability is symptomatic of introgression between these taxa. Therefore, because of the introgression, they should be recognized at the varietal level rather than as separate species.

Silphium dentatum already has varietal status as *S. asteriscus* var. *dentatum* (Elliott) Chapman and will be recognized as such (Chapman, 1860). *Silphium trifoliatum* var. *trifoliatum*, *S. trifoliatum* var. *latifolium* A. Gray, and *S. simpsonii* should be transferred herein to *S. asteriscus*. *Silphium confertifolium* will be placed in synonymy with *Silphium asteriscus* var. *latifolium*.

***Silphium asteriscus* L.**, Sp. Pl. 2: 920. 1753.

TYPE: "Asteriscus coronae solis flore et facie" in Dillenius, Hort. Eltham., 42, t. 37, f. 42. 1732 (lectotype, designated by Perry (1937: 292)).

Silphium asteriscus* var. *simpsonii (Greene) J. A. Clevinger, comb. nov. Basionym: *Silphium simpsonii* Greene, Pittonia 4: 45. 1899. TYPE: U.S.A. Florida: Palma Sola, in damp ground in pine barrens, 8 July 1890, *J. H. Simpson 81* (holotype, US).

Silphium asteriscus var. *simpsonii* is most closely allied to *S. asteriscus* var. *dentatum* and *S. asteriscus* var. *angustatum*. They share the characteristic of stipitate glands on the paleae. Stipitate glands are absent in other varieties of *Silphium asteriscus* but are also found in *Silphium laciniatum* L., *Silphium perplexum* J. Allison, and *Silphium glutinosum* J. Allison. Additionally, *Silphium asteriscus* var. *simpsonii*, variety *dentatum*, and variety *angustatum*, along with variety *asteriscus* and variety *scabrum*, share the characteristics of predominantly alternate phyllotaxy and scabrous to hispid leaves. This is in contrast to the predominantly opposite or whorled phyllotaxy and glabrous leaves of variety *trifoliatum*

and variety *latifolium*. *Silphium asteriscus* var. *simpsonii* can be distinguished from its closest allies, variety *dentatum* and variety *angustatum*, by its height (0.2–1.1 m vs. 0.5–1.5 m) and persistent basal rosette.

Silphium asteriscus var. *simpsonii* is restricted to the southeastern U.S. and is primarily found in Florida. Perry (1937) divided *Silphium simpsonii* into two varieties. *Silphium simpsonii* var. *wrightii* Perry, found in the southwestern U.S., should not be included here. Rather, because of its large number of ray flowers (20 to 30+), I reduce *Silphium simpsonii* var. *wrightii* to synonymy of *S. radula* var. *radula*. During the summer of 2002, *Silphium asteriscus* var. *simpsonii* was collected in Florida and added to the Clevinger and Panero (2000) molecular data set for phylogenetic analysis. In the resulting phylogenetic tree, *Silphium asteriscus* var. *simpsonii* was allied with *Silphium asteriscus* rather than *Silphium radula*.

Silphium asteriscus* var. *trifoliatum (L.) J. A. Clevinger, comb. nov. Basionym: *Silphium trifoliatum* L., Sp. Pl. 2: 920. 1753. *Silphium ternifolium* Michaux, Fl. Bor. Amer. (Michaux) 2: 146. 1803. TYPE: "Habitat in Virginia" (lectotype, designated by Reveal in Jarvis & Turland (1998: 367), LINN microfiche # 1032.8, photos, F, GH).

Fieldwork shows that *Silphium asteriscus* var. *trifoliatum* is most closely allied to *Silphium asteriscus* var. *latifolium*. They share the characteristics of glabrous leaves, peduncles, and stems in contrast to all other varieties of *Silphium asteriscus*. *Silphium asteriscus* var. *trifoliatum* is easily distinguished in the northeastern U.S. because of its trifoliate leaf arrangement. However, these same populations also contain individuals with alternate, opposite, or 4-foliate leaf arrangements. Along the southern edge of the varietal range, where it overlaps with *S. asteriscus* var. *asteriscus* and *S. asteriscus* var. *latifolium*, these alternate, opposite, and 4-foliate leaf arrangements become more predominant.

Silphium asteriscus* var. *latifolium (A. Gray) J. A. Clevinger, comb. nov. Basionym: *Silphium trifoliatum* L. var. *latifolium* A. Gray, Syn. Fl. N. Amer. 1: 241. 1884. TYPE: U.S.A. Alabama: July 1840, *S. B. Buckley* s.n. (holotype, GH).

Silphium confertifolium Small, Fl. S.E. U.S. 1243, 1340. 1903. Syn. nov. TYPE: U.S.A. Alabama: Choctaw Co., Cocoa, 13–15 Oct. 1896, *C. Schuchert* s.n. (holotype, NY; isotypes, NY, US).

Like the other varieties of *Silphium asteriscus*, variety *latifolium* has ray flowers that number 8 to 21. This variety is distinguished by its predominantly opposite phyllotaxy and glabrous leaves and stems. In my fieldwork, I found that when *Silphium asteriscus* var. *latifolium* populations come in contact with variety *asteriscus* there is a mix of glabrous and pubescent plants. When its populations come in contact with variety *trifoliatum*, there is a mix of opposite and trifoliate leaf arrangements on the plants. Because of this introgression that I observed in the field, variety *latifolium* is placed in *S. asteriscus*.

I conclude that *Silphium confertifolium* represents an environmental variant of *S. trifoliatum* var. *latifolium* and should not retain its status as a distinct species. This is based upon examination of herbarium specimens and visits to sites in Dallas Co., Alabama, which is the locality of historic *S. confertifolium* collections (*Godfrey 69684*, *Jones 752*, NCU). Cronquist (1980) distinguished these two species on the basis of height and leaf distribution. *Silphium confertifolium* ranges in height from 0.4 to 1 m with basally disposed leaves, while *Silphium trifoliatum* var. *latifolium* ranges in height from 1 to 2 m with evenly distributed leaves. In the field I observed a continuum of plants within populations that varied in stature and leaf distribution according to proximity to chalk outcroppings. The plants closest to the chalk outcroppings were always the shortest in height with reduced leaves, and the ones furthest were tallest in height with evenly distributed leaves.

The recognition of *Silphium asteriscus* var. *trifoliatum* and variety *latifolium* is in agreement with the dissertation work of W. R. Weber (1968). Weber conducted extensive hybridization studies and concluded that *S. asteriscus* and *S. trifoliatum* are not reproductively isolated. Weber also concluded that phyllotaxy was variable between these two species. Weber and his adviser, T. R. Fisher, proposed in Weber's dissertation that *S. trifoliatum* var. *trifoliatum* and *S. trifoliatum* var. *latifolium* should be reduced to varietal rank within *S. asteriscus*. However, these changes were never formally published.

SILPHIUM RADULA NUTTALL

Silphium radula Nuttall, Trans. Amer. Philos. Soc., n.s. 7: 354. 1841. TYPE: U.S.A. Plains of Arkansas, *T. Nuttall* s.n. (holotype, BM).

Silphium simpsonii Greene var. *wrightii* L. M. Perry, Rhodora 39: 288. 1037. Syn. nov. TYPE: U.S.A. Texas: 1848, *C. Wright* s.n. (holotype, GH).

Silphium simpsonii var. *wrightii* is reduced here-

in to synonymy of *Silphium radula* based on the examination of the type specimen at GH. Gandhi and Thomas (1989) recognized both *S. radula* and *S. simpsonii* var. *wrightii* and stated that they differ only in the number of capitula and leaf texture. I have observed that these differences are quite variable, and these two entities should not be separated.

Silphium radula* var. *gracile (A. Gray) J. A. Clevinger, comb. et stat. nov. Basionym: *Silphium gracile* A. Gray, Proc. Amer. Acad. Arts 8: 653. 1873. TYPE: U.S.A. Texas: Harris Co., Houston, 1842, *F. J. Lindheimer s.n.* (lectotype, selected here, GH; isotype, GH).

Silphium radula var. *gracile* is recognized by a persistent basal rosette and ray flowers numbering 12 to 18. In contrast, *Silphium radula* var. *radula* has a caducous basal rosette and ray flowers numbering 20 to 30. Perry (1937) and others have suggested that the southwestern U.S. *Silphium radula* var. *gracile* is allied to the southeastern U.S. *Silphium asteriscus* var. *simpsonii*. These two varieties resemble one another in their persistent basal rosettes and reduced stature. However, *Silphium radula* var. *gracile* and variety *radula* have pubescent phyllaries and are found in Arkansas, Louisiana, Oklahoma, and Texas, while *Silphium asteriscus* var. *simpsonii* has glabrous phyllaries and is found in Alabama, Florida, Georgia, Mississippi, and South Carolina. *Silphium radula* var. *gracile* (as *Silphium gracile*) was included in the molecular study of Clevinger and Panero (2000). On the basis of ITS and ETS sequence data, this variety was demonstrated to be sister to *S. radula* var. *radula*.

Asa Gray cited two collections, those of Hall and of Lindheimer, in his description of *Silphium gracile*. He did not designate either as the holotype; therefore, they are syntypes. According to Gray, the Lindheimer specimens have larger leaves and more pubescence than the Hall specimens. Both descriptions fit Gray's concept of *S. gracile* and my concept of *S. radula* var. *gracile*. I have seen the two Lind-

heimer collections at GH. The status of the Hall collections is uncertain; I have seen two 1872 collections at F and NY labeled *Hall 321* (Gray does not cite a number in his description) but none at GH. Given this uncertainty, I have chosen the Lindheimer collection at GH to serve as the lectotype.

Acknowledgments. I am grateful to Jose L. Panero, Beryl Simpson, Billie Turner, Doug Goldman, Curtis Clevinger, James Allison, Conley K. McMullen, Lowell and Mary Amick, and the curators of the following herbaria for the loan of specimens: F, FLAS, GH, IA, LL, LSU, MICH, MO, MSC, NCU, NY, OS, TENN, TEX, US, and USCH. This paper represents a portion of a doctoral dissertation by the author submitted to the Department of Botany at the University of Texas at Austin. Support for some aspects of this study was provided by grants from the American Society of Plant Taxonomists and the Virginia Academy of Science.

Literature Cited

- Chapman, A. W. 1860. Flora of the Southern United States: Containing an Abridged Description of the Flowering Plants and Ferns of Tennessee, North and South Carolina, Georgia, Alabama, Mississippi and Florida: Arranged According to the Natural System. Ivison, Phinney, New York.
- Clevinger, J. A. 1999. Systematics of *Silphium* and Its Subtribe Engelmanniinae (Asteraceae: Heliantheae). Ph.D. Dissertation, The University of Texas at Austin.
- & J. L. Panero. 2000. Phylogenetic analysis of *Silphium* and subtribe Engelmanniinae (Asteraceae: Heliantheae) based in ITS and ETS sequence data. Amer. J. Bot. 87: 565–572.
- Cronquist, A. 1980. Vascular Flora of the Southeastern United States, Vol. I: Asteraceae. Univ. North Carolina Press, Chapel Hill.
- Gandhi, K. N. & R. D. Thomas. 1989. Asteraceae of Louisiana. Sida Bot. Misc. 4.
- Jarvis, C. E. & N. Turland. 1998. Typification of Linnaean specific and varietal names in the Compositae (Asteraceae). Taxon 47: 347–370.
- Perry, L. M. 1937. Notes on *Silphium*. Rhodora 39: 281–297.
- Weber, W. R. 1968. Biosystematic Studies in the Genus *Silphium* L. (Compositae): Investigations in the Selected Intraspecific Taxa of *Silphium asteriscus* L. Ph.D. Dissertation, The Ohio State University.